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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/774,496	02/10/2004	Yoshihisa Iba	042075	8914

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EXAMINER

CHEN, JACK S J

ART UNIT	PAPER NUMBER
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2813

DATE MAILED: 06/05/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/774,496

Applicant(s)

IBA, YOSHIHISA

Examiner

Jack Chen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 21 March 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-19 is/are pending in the application.
- 4a) Of the above claim(s) 3-5 and 10-19 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,2 and 6-9 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- 1) ☒ Certified copies of the priority documents have been received.
 - 2) ☐ Certified copies of the priority documents have been received in Application No. _____.
 - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>2/10/04</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. Applicant's election of Species I with claims 2, 6-9 indicated by Applicant to read thereon, in the reply filed on March 21, 2006 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).
2. Claims 3-5 and 10-19 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected species, there being no allowable generic or linking claim.

Priority

3. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Information Disclosure Statement

4. The information disclosure statement filed on February 10, 2004 has been considered.

Oath/Declaration

5. Oath/Declaration filed on February 10, 2004 has been considered.

Specification

6. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

The specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claim Rejections - 35 USC § 112

7. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

8. Claims 1-2, 6-9 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Re claim 1, the phrase "etching the third hard mask with the fourth hard mask" is unclear and indefinite (note: the fourth hard mask is not capable of etching the third hard mask, etching is normally carried out under suitable etchants, etc.).

Re claim 1, the phrase "etching the second hard mask with the third hard mask" is unclear and indefinite (i.e., one hard mask can't be used to etching other hard mask, also see above).

Re claim 1, the phrase "etching the first hard mask with the third hard mask" is unclear and indefinite (i.e., one hard mask can't be used to etching other hard mask, also see above).

Re claim 1, the phrase "etching the interlayer insulating film with the third hard mask" is unclear and indefinite (note: the third hard mask is not capable of etching the interlayer insulating film, etching is normally carried out under suitable etchants, etc.).

Re claim 1, page 23, the phrase "the interlayer dielectric" lacks antecedent basis.

Re claim 9, the phrase “etching the second hard mask with the third hard mask” is unclear and indefinite (i.e., one hard mask can’t be used to etching other hard mask, also see above).

The remaining claims 2, 6-8 are rejected for depending from the above rejected claims.

For the purpose of patentability, these claims will be interpreted as best understood.

Claim Rejections - 35 USC § 102

9. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

10. Claims 1-2, 6 and 9 are rejected under 35 U.S.C. 102(e) as being anticipated by Huang et al., US Pub. No. 2003/0119305 A1.

Re claim 1, Huang et al. disclose a method for manufacturing a semiconductor device having the step of forming a wiring 66 (fig. 26) by a damascene method, which comprises forming an etching stopper film 56 and an interlayer insulating film 52 in sequence over a conductive layer 54 (fig. 15); forming a silicon nitride film 58 (fig. 15, paragraph 33) as a first hard mask over the interlayer insulating film; forming a silicon oxide film 59 (fig. 15, paragraph 33) as a second hard mask over the first hard mask; forming a silicon nitride film as a third hard mask 60 (fig. 15, paragraph 33) over the second hard mask; forming a silicon oxide film 61 (fig. 15, paragraph 33) as a fourth hard mask over the third hard mask; forming a pattern 62 (fig.

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16) over the fourth hard mask; etching the third hard mask (fig. 16); etching the second hard mask (fig. 16); etching the first hard mask (fig. 20); forming an opening 63 which reaches the etching stopper film in the interlayer insulating film 52 by etching the interlayer insulating film (fig. 21); etching a portion of the etching stopper film which is exposed from the opening formed in the interlayer dielectric (fig. 22); and embedding a wiring material 66 (fig. 26) in the opening, see figs. 1-29 and page 1-5 for more details.

Re claim 2, wherein a low dielectric constant insulating film is used as the interlayer insulating film 52 (fig. 15, paragraph 29).

Re claim 6, wherein the etching stopper film 56 is a silicon carbide film or a silicon nitride film (fig. 15, paragraph 31).

Re claim 9, wherein said step of etching the second hard mask comprises the step of removing the fourth hard mask (fig. 16, i.e., at least portion(s) of the fourth hard mask is removed).

Claim Rejections - 35 USC § 103

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

12. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Huang et al., US Pub. No. 2003/0119305 A1.

Huang et al. disclosed in above, and in particular paragraph 32 shows that the mask films 58 through 61 (fig. 15) range from about 200 to 1000 angstroms each in thickness. However, Huang et al. is silent to the thickness of the third hard mask is more than twice that of the first hard mask.

Since Huang et al. disclosed each of the hard mask films having thickness of about 200 to 1000 angstroms, the subject matter as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made to select any suitable thicknesses for the first and third hard masks within the above given range in the method of Huang et al. in order to protect the underlying layer(s) during the step(s) of etching.

Furthermore, the claimed ranges of the hard masks thicknesses, absent evidence of disclosure of criticality for the range giving unexpected results are considered to involve routine optimization while has been held to be within the level of ordinary skill in the art. As noted in *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955), the selection of reaction parameters such as temperature and concentration would have been obvious. See also *In re Waite* 77 USPQ 586 (CCPA 1948); *In re Scherl* 70 USPQ 204 (CCPA 1946); *In re Irmischer* 66 USPQ 314 (CCPA 1945); *In re Norman* 66 USPQ 308 (CCPA 1945); *In re Swenson* 56 USPQ 372 (CCPA 1942); *In re Sola* 25 USPQ 433 (CCPA 1935); *In re Dreyfus* 24 USPQ 52 (CCPA 1934).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jack Chen whose telephone number is (571)272-1689. The examiner can normally be reached on Monday-Friday (9:00am-6:30pm) alternate Monday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl W. Whitehead can be reached on (571)272-1702. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Jack Chen
Primary Examiner
Art Unit 2813

May 29, 2006